NON-PUBLIC?: N
ACCESSION #: 9402150395
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Clinton Power Station PAGE: 1 OF 6

DOCKET NUMBER: 05000461

TITLE: Incorrectly Positioned Steam Flow Control Valve Due To Operators' Lack of Full Understanding of the Design of the Valve's Controller Results in Saturated Offgas System, Loss of Condenser Vacuum, and Manual Reactor SCRAM
EVENT DATE: 12/20/93 LER #: 93-007-00 REPORT DATE: 01/17/94

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 060

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: J. M. Hall, System Engineer TELEPHONE: (217) 935-8881 Extension 3949
COMPONENT FAILURE DESCRIPTION:
CAUSE: A SYSTEM: SH COMPONENT: 84 MANUFACTURER: M138
X JC LT R369
REPORTABLE NPRDS: N
Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

With the plant at 100 percent reactor power, operators were attempting to place a second Steam Jet Air Ejector (SJAE) in service so its new steam flow pressure controller could be tuned. When the main steam inlet isolation valve was opened, a high steam flow rate saturated the offgas system desiccant dryer with moisture and iced up the charcoal adsorber gas cooler, causing a loss of the capability to remove non-combustibles from the condenser. This led to the loss of condenser vacuum and a manual reactor scram at sixty percent reactor power. In preparing to put the SJAE in service, the operator verified the steam flow pressure controller setpoint dial was set at the zero position as directed by the

procedure. The steam flow control valve was believed to be fully closed, which would have prevented the high steam flow when the isolation valve was opened. The cause of this event is a lack of operators' full understanding of the steam flow pressure controller design and how it relates to operating the control valve. Corrective action for the event includes revising the system operating procedure to identify the proper operation of the controller and training operators on that operation.

END OF ABSTRACT

DESCRIPTION OF EVENT

On December 20, 1993, the plant was in Mode 1 (POWER OPERATION) at about 100 percent reactor RCT! power. Operators were preparing to start up the "B" Steam Jet Air Ejector (SJAE) EJR! SH! and place it in operation so Maintenance technicians could tune its recently installed new main steam SB! flow pressure controller PC! , 1B21-N544, and improve the response time of the SJAE main steam flow control valve FCV!. The "A" SJAE was inservice. Condenser vacuum was 28.1 inches of mercury.

In preparation for the SJAE evolution, at approximately 0950 hours, the Operations Shift Supervisor (SS) held a briefing about the evolution with personnel who were going to be involved with it.

At about 1007 hours, operators began the startup process for the SJAE in accordance with system operating procedure CPS 3215.01, "Off-Gas (OG)." In accordance with the procedure, the new steam flow pressure controller setpoint dial was verified to be set to the zero position which normally closes the main steam flow control valve. At about 1020 hours, Main Steam inlet isolation valve ISV! 1B21-F304B was opened to admit steam to the "B" SJAE. The Main Control Room (MCR) operator noted indications of high steam flow and high moisture through the "B" SJAE and immediately directed the area operator stationed at the steam flow pressure controller to adjust the controller down to shut the main steam flow control valve. The operator responded by adjusting the controller down below the zero position (hard close). Because of the slow response of the control valve, the operator did not observe a change in steam flow. The operator continued to adjust the dial beyond the hard close position to an unmarked section of the dial. (The dial on the old controller had an interference which prevented its adjustment into the unmarked section.) With the new controller dial positioned in the unmarked section, the flow control valve received a maximum steam flow demand signal and went full open. Offgas system WF! flow decreased to zero standard cubic feet per minute (SCFM).

At about 1025 hours, the MCR operator closed the main steam inlet isolation valve to shut off the steam supply to the "B" SJAE, Operators attempted to reestablish offgas system flow with the "A" SJAE but were not successful. Condenser COND! vacuum SH! began to decrease.

At about 1050 hours, operators began reducing reactor power by reducing Reactor Recirculation system AD! flow. Operators continued attempts to reestablish offgas system flow by shifting system flow to the alternate gas dryer DRY! desiccant bed and restoring potentially blown out intercondenser and vacuum breaker loop seals SEAL! on the "A" SJAE loop. At about 1058 hours, operators reduced reactor power further by inserting control rods. The Operations shift supervision conferred and directed operators to initiate a manual reactor SCRAM if condenser vacuum decreased to 23 .5 inches of mercury.

At about 1106 hours, with the plant at about sixty percent reactor power, condenser vacuum decreased to 23.5 inches and operators initiated a reactor SCRAM by placing the reactor mode switch HS! in the shutdown position. Operators implemented the reactor SCRAM procedure. Reactor water level decreased to the low reactor water level 3 trip (8.9 inches on the wide-range instrument) initiating automatic close signals to containment isolation valves in Groups 2 (Residual Heat Removal (RHR) system BO! to upper containment pools), 3 (RHR shutdown cooling) and 20 (miscellaneous valves).

In response to the level 3 trip, operators implemented Emergency Operating Procedure (EOP) 1, "RPV Control," for control of rea
tor pressure and water
level. Reactor water level decreased to minus 6.5 inches (on the wide-range instrument) before beginning to increase. The "B" Turbine TRB!-Driven Reactor Feed Pump P!(TDRFP) was manually tripped off to control the increasing reactor water level.

At about 1107 hours, reactor water level increased to the high reactor water level 8 trip (52.0 inches on the narrow-range instrument) initiating a trip of the Main Turbine TA! and the "A" TDRFP. Reactor water level increased to its highest level, 74.2 inches (on the upset range instrument), at about 1109 hours.

Operators started a mechanical vacuum pump to restore vacuum at about 1113 hours.

By 1115 hours, reactor water level returned to the normal band and

operators exited procedure EOP-1.

At 1125 hours, in response to the low reactor water level 3 trip, operators completed off-normal checklist CPS 4001.02C001, "Automatic Isolation Checklist," verifying that the containment isolation valves in Groups 2, 3, and 20 were correctly in the closed position.

At about 1215 hours, the outboard main steam isolation valves were slow-closed to control the reactor cooldown rate within the Technical Specification limits. Reactor pressure was being controlled using main steam line drains, and level was being controlled using the Control Rod Drive system AA! and the motor MO!-driven reactor feed pump.

At about 12:35 hours all operator actions of off-normal procedure CPS 4100.01, "Reactor SCRAM," were completed.

Condition Report 1-93-12-030 was initiated to track the root cause and corrective action determinations for the event.

A review of the event determined that the SJAE main steam flow control valve was not closed as operators believed when they opened main steam inlet isolation valve 1B21-F304B. Before the event, the steam flow pressure controller was set to zero pressure which normally positions the control valve in the fully dosed position. Normally, the SJAE is placed in service with the control valve closed. The main steam inlet isolation valve is then opened and the operator gradually increases steam flow by increasing the steam flow pressure controller setpoint.

When isolation valve 1B21-F304B was opened, steam flow to the SJAE was too high. Although the steam flow was isolated within a few minutes, the initial high steam flow rate saturated the offgas system desiccant dryer with moisture and iced up the charcoal adsorber ADS! gas cooler CLR!, causing a loss of the capability to remove non-condensibles from the condenser. This led to the loss of condenser vacuum.

During the event, a high Heating, Ventilating, and Air Conditioning (HVAC)VL! stack release rate indication was noted; however, the high release rate was confirmed to be invalid by comparison with other monitors.

During the event, several equipment problems were identified. Division 1 level transmitter 1B21-N080A did not trip as designed when reactor water level decreased to level 3. Maintenance Work Request (MWR) D55819 was initiated to track correction of this deficiency.

MCR operators were unable to close the "A" SJAE suction valve, 1CA002A, from the MCR switch by isolating air to its actuator 84!. To prevent a loss of vacuum through valve 1CA002A, operators shut the "A" and "B" gas dryer desiccant bed inlet isolation valves 1N66121A and 1N66121B. MWR D55817 was initiated to track correction of this deficiency.

A ground was detected on the 125 Volts Direct Current (VDC) Motor Control Center (MCC) and Distribution Panel PL! 1E when the main turbine was placed on the turning gear TGR!. MWR D55728 was initiated to track investigation of this deficiency.

Following this event, a mechanical stop was installed on the new controller's setpoint dial to make its operation similar to the old controller dial. Having the mechanical stop in place during the event would have helped mitigate the consequences of the event by preventing the controller from being turned past the hard close position. Thus, the controller would have continued closing the control valve, reducing steam flow into the Offgas system.

No other automatic or manually initiated safety system responses were necessary to place the plant in a safe and stable condition. No other equipment or components were inoperable at the start of this event to the extent that their inoperable condition contributed to this event.

CAUSE OF EVENT

The cause of this event is attributed to the operators' lack of full understanding of the design of the steam flow pressure controller and how the design relates to operating the control valve.

The lack of understanding of the controller design was exhibited in the system operating procedure. System operating procedure CPS 3215.01 provides the direction to operators for starting SJAEs and shifting from one operating SJAE to the other. The procedure directed operators to set the steam flow pressure controller setpoint dial at the zero position prior to opening the main steam inlet isolation valve. The setpoint dial has a range of zero to 300 which relates to pressure in pounds per square inch in the steam line downstream from the main steam flow control valve. Based on previous experience using the controller, the operator believed that placing the setpoint dial at zero closed the main steam flow control valve. However, due to calibration tolerances, instrument drift, steam line pressure, etcetera, placing the setpoint dial at the zero position may or may not close the control valve. The position of the setpoint

dial is not directly proportional to the position of the control valve. The purpose of the setpoint dial is to allow the operator to set the steam line pressure at the desired value and the controller automatically maintains that pressure value. During this event, with the setpoint dial at zero, the controller sensed that the steam line had a lower pressure (possibly a slight negative pressure) than the setpoint value and opened the control valve to equalize the steam line pressure with the setpoint value. The system design requires that the setpoint dial be placed in the "hard close" position to ensure the control valve is closed. This information was not fully understood and was not translated into the system operating procedure when it was originated.

The controller contains two gauges PI! which indicate the service air pressure input to the controller and the controller air pressure output to the control valve. By placing the setpoint dial so the controller output is above thirty pounds per square inch and equal to the controller input pressure, the operator is assured the control valve is in the fully closed position. Because of the lack of full understanding of the controller, the operator was not aware of the correct correlation between the controller output air pressure gauge and the control valve position.

CORRECTIVE ACTION

A detailed plan was developed and implemented to restore the plant from the results of this event. The plan included provisions for removing moisture from the desiccant dryer beds, removing ice from the gas cooler, returning the offgas system to normal status, and revising operating procedure CPS 3215.01.

System operating procedure CPS 3215.01 has been revised to require a verification that the main steam flow control valve to the SJAE is closed by visually examining the valve prior to opening the SJAE main steam inlet isolation valve when starting up SJAEs or shifting operation from one SJAE to the other. The procedure was also

revised to require a verification that the steam flow pressure controller is in the "hard close" position; that is, the controller output is above thirty pounds per square inch and equal to the controller input pressure. This verification also indicates the control valve is in the closed position.

Operators will be trained on the proper operation of the steam flow pressure controller.

ANALYSIS OF EVENT

This event is reportable under the provisions of 10CFR50.72(a)(2)(iv) due to the manual initiation of the Reactor Protection System JC! (SCRAM).

Assessment of the safety consequences and implications of this event identified that this event was not nuclear safety significant. The Updated Safety Analysis Report (USAR) discusses the loss of condenser vacuum in Chapter 15 and the transient is within the design basis of the plant. The manually initiated SCRAM prior to reaching the vacuum protective actions precluded the transient behavior described in the USAR and placed the plant in a safe condition. No unexpected or abnormal plant responses were observed during the event.

ADDITIONAL INFORMATION

The Division 1 level transmitter 1B21-N080A, which did not trip as designed when reactor water level decreased to level 3, is a model number 1153DB4PC transmitter manufactured by Rosemount, Incorporated.

The actuator for the "A" SJAE suction valve 1CA002A which would not allow the valve to open when its air was isolated is a 24-inch, double-acting pneumatic cylinder, model number 33082 SR80, manufactured by the MATRYX Company.

A review of previous Clinton Power Station LERs identified several reactor trips involving a loss of condenser vacuum. One event, LER 87-050-00, occurred as operators were in the process of shifting from the "B" SJAE to the "A" SJAE. However, none of the previous LERs occurred because of a similar root cause.

For further information regarding this event, contact J. M. Hall, System Engineer at (217) 935-8881, extension 3949.

ATTACHMENT TO 9402150395 PAGE 1 OF 1

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January 17, 1994
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Docket No. 50-461
10CFR50.73

Document Control Desk
Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Clinton Power Station - Unit 1
Licensee Event Report No. 93-007-00

Dear Sir:

Please find enclosed Licensee Event Report No. 93 -007-00:
Incorrectly Positioned Steam Flow Control Valve Due to Operators' Lack of Full Understanding of the Design of the Valve's Controller Results in Saturated Offgas System, Loss of Condenser Vacuum, and Manual Reactor SCRAM. This report is being submitted in accordance with the requirements of 10CFR50.73.

Sincerely yours,

J. S. Perry
Senior Vice President

RSF/csm

Enclosure

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety
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